

IN THE CLAIMS:

Please ADD new claims 56 -95, as follows. For the Examiner's convenience, all claims currently pending in this application have been reproduced below:

1. (Previously Presented) A projection exposure apparatus comprising:

a projection optical system arranged to project a pattern onto a substrate;

a holding portion arranged to hold an optical element which propagates light toward said projection optical system;

@ a mask having a transmission portion and being disposed on or near an image plane or object plane of said projection optical system or a plane conjugate to the image plane and the object plane;

an actuator arranged to drive said mask along a plane of an image of said optical element formed by said projection optical system; and

a measurement device arranged to measure an intensity of light while said mask is driven, the light emerging from said optical element, and passing through said projection optical system and the transmission portion of said mask, said measurement device including a measurement surface positioned at a plane conjugate to a pupil plane of said projection optical system or a plane spaced apart from said mask enough to separately detect respective rays emerging from plural points of the pupil plane and passing through the transmission portion.

2. (Original) The apparatus according to claim 1, further comprising an arithmetic device for calculating aberration of said projection optical system on the basis of a measurement result of said measurement device.

3. (Original) The apparatus according to claim 1, further comprising an arithmetic device for calculating ray aberration of said projection optical system on the basis of a measurement result of said measurement device.

4. (Original) The apparatus according to claim 1, further comprising an arithmetic device for calculating wavefront aberration of said projection optical system on the basis of a measurement result of said measurement device.

5. (Original) The apparatus according to claim 1, wherein
said optical element is arranged near the object plane of said projection optical system, and
said mask is arranged near the image plane of said projection optical system.

6. (Original) The apparatus according to claim 5, wherein
said optical element includes a mask having a transmission portion, and
light is emitted toward said projection optical system by illuminating said mask serving as said optical element by an illumination system.

7. (Original) The apparatus according to claim 1, wherein

said optical element is arranged near the image plane of said projection optical system, and

said mask is arranged near the object plane of said projection optical system.

8. (Original) The apparatus according to claim 7, wherein

said optical element includes a mask having a transmission portion, and

light is emitted toward said projection optical system by illuminating said mask serving as said optical element by an illumination system.

9. (Original) The apparatus according to claim 7, wherein

the projection exposure apparatus further comprises an illumination system,

said optical element includes a reflecting member, and

said reflecting member reflects, toward said projection optical system, light which is emitted by said illumination system and is incident on said reflecting member via said projection optical system.

10. (Original) The apparatus according to claim 9, further comprising a reflecting mirror for deflecting light which emerges from said optical element and passes through said projection optical system, and guiding the light to said mask.

11. (Original) The apparatus according to claim 1, wherein

said optical element is arranged near the object plane of said projection optical system,

said mask is arranged near a plane conjugate to the object plane of said projection optical system,

the projection exposure apparatus further comprises a first reflecting mirror arranged on the image plane side of said projection optical system, and a second reflecting mirror for reflecting, toward said measurement devices, light which is reflected by said first reflecting mirror and passes through said projection optical system, and

light which emerges from said optical element passes through said projection optical system, is reflected by said first reflecting mirror, passes through said projection optical system again, is reflected by said second reflecting mirror, and guided to said mask.

12. (Original) The apparatus according to claim 1, wherein

said optical element and said mask are arranged near the object plane of said projection optical system,

the projection exposure apparatus further comprises a reflecting mirror arranged on the image plane side of said projection optical system, and

light which emerges from said optical element passes through said projection optical system, is reflected by said reflecting mirror, passes through said projection optical system again, and is guided to said mask.

13. (Original) The apparatus according to claim 1, wherein

said optical element and said mask are arranged near the image plane of said projection optical system,

the projection exposure apparatus further comprises a reflecting mirror arranged on the object plane side of said projection optical system, and

light which emerges from said optical element passes through said projection optical system, is reflected by said reflecting mirror, passes through said projection optical system again, and is guided to said mask.

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14. (Original) The apparatus according to claim 1, wherein a predetermined region near the image plane or object plane of said projection optical system falls within an isoplanatic region of said projection optical system.

15. (Original) The apparatus according to claim 1, wherein light which emerges from a predetermined region near the image plane or object plane of said projection optical system sufficiently covers a pupil of said projection optical system.

16-55. (Cancelled)

56. (New) A projection exposure apparatus comprising:

an illumination system;

a projection optical system for projecting a pattern on a substrate;

a holding portion for holding a first mask having a first transmission portion between said illumination system and said projection optical system;

a second mask which is arranged near an image-side focal position of said projection optical system and has a second transmission portion;

an actuator for driving said second mask along an image plane of said projection optical system; and

a measurement device for measuring a change in intensity of light which is emitted by said illumination system and passes through the first transmission portion, said projection optical system, and the second transmission portion while said second mask is driven.

57. (New) The apparatus according to claim 56, further comprising an arithmetic device for calculating aberration of said projection optical system on the basis of a measurement result of said measurement device.

58. (New) The apparatus according to claim 56, further comprising an arithmetic device for calculating ray aberration of said projection optical system on the basis of a measurement result of said measurement device.

59. (New) The apparatus according to claim 56, further comprising an arithmetic device for calculating wavefront aberration of said projection optical system on the basis of a measurement result of said measurement device.

60. (New) The apparatus according to claim 56, further comprising an imaging optical system for imaging an exit pupil of said projection optical system on a measurement surface of said measurement device.

61. (New) The apparatus according to claim 60, wherein said actuator drives said measurement device and said imaging optical system together with said second mask.

62. (New) The apparatus according to claim 60, wherein
said second mask, said imaging optical system, and said measurement device
constitute an integral measurement unit, and
said actuator drives said measurement unit along the image plane of said
projection optical system.

63. (New) The apparatus according to claim 56, wherein said first mask has a plurality of first transmission portions.

64. (New) The apparatus according to claim 56, wherein said first mask has a transfer pattern to be transferred to the substrate, in addition to the first transmission portion.

65. (New) A projection exposure apparatus comprising:
an illumination system;
a projection optical system for projecting a pattern on a substrate;

a first holding portion for holding a first mask having a first transmission portion between said illumination system and said projection optical system;

a first reflecting mirror arranged on an image plane side of said projection optical system;

a second mask which is arranged between said illumination system and said projection optical system and has a second transmission portion;

a second reflecting mirror for deflecting, toward the second transmission portion, light which is emitted by said illumination system, passes through the first transmission portion and said projection optical system, is reflected by said first reflecting mirror, and passes through said projection optical system again;

an actuator for driving said second mask in a predetermined plane; and

a measurement device for measuring an intensity of light which is emitted by said illumination system, passes through the first transmission portion of said first mask and said projection optical system, is reflected by said first reflecting mirror, passes through said projection optical system again, is reflected by said second reflecting mirror, and passes through the second transmission portion of said second mask while said second mask is driven.

66. (New) The apparatus according to claim 65, further comprising an arithmetic device for calculating aberration of said projection optical system on the basis of a measurement result of said measurement device.

67. (New) The apparatus according to claim 65, further comprising an arithmetic device for calculating ray aberration of said projection optical system on the basis of a measurement result of said measurement device.

68. (New) The apparatus according to claim 65, further comprising an arithmetic device for calculating wavefront aberration of said projection optical system on the basis of a measurement result of said measurement device.

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69. (New) The apparatus according to claim 65, wherein said first reflecting mirror includes a spherical mirror.

70. (New) The apparatus according to claim 65, wherein said second reflecting mirror includes a half-mirror which transmits light emitted by said illumination system toward said projection optical system, and reflects, toward the second transmission portion of said second mask, light which is reflected by said first reflecting mirror and passes through said projection optical system.

71. (New) A projection exposure apparatus comprising:
an illumination system;
a projection optical system for projecting a pattern on a substrate;
a holding portion for holding a first mask having a first transmission portion between said illumination system and said projection optical system;

a second mask which is arranged near an object plane of said projection optical system and has a second transmission portion;

a reflecting mirror arranged on an image plane side of said projection optical system, light which is emitted by said illumination system, passes through the first transmission portion and said second projection optical system, is reflected by said reflecting mirror, and passes through said projection optical system again being incident on the second transmission portion;

an actuator for driving said second mask along the object plane of said projection optical system; and

C' a measurement device for measuring an intensity of light which is emitted by said illumination system, passes through the first transmission portion and said projection optical system, is reflected by said reflecting mirror, passes through said projection optical system again, and passes through the second transmission portion while said second mask is driven.

72. (New) The apparatus according to claim 71, further comprising an arithmetic device for calculating aberration of said projection optical system on the basis of a measurement result of said measurement device.

73. (New) The apparatus according to claim 71, further comprising an arithmetic device for calculating ray aberration of said projection optical system on the basis of a measurement result of said measurement device.

74. (New) The apparatus according to claim 71, further comprising an arithmetic device for calculating wavefront aberration of said projection optical system on the basis of a measurement result of said measurement device.

75. (New) The apparatus according to claim 71, wherein said reflecting mirror includes a spherical mirror.

76. (New) A projection exposure apparatus comprising:

a substrate stage;

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a projection optical system for projecting a pattern on a substrate on said substrate stage;

a first mask which is arranged between said projection optical system and said substrate stage and has a first transmission portion;

an illumination system for illuminating the first transmission portion;

a second mask which is arranged between said projection optical system and said substrate stage and has a second transmission portion;

a reflecting mirror arranged on an object side of said projection optical system, light which is emitted by said illumination system, passes through the first transmission portion and said projection optical system, is reflected by said reflecting mirror, and passes through said projection optical system again being incident on the second transmission portion;

an actuator for driving said second mask along an image plane of said projection optical system; and

a measurement device for measuring an intensity of light which is emitted by said illumination system, passes through the first transmission portion and said projection optical system, is reflected by said reflecting mirror, passes through said projection optical system again, and passes through the second transmission portion while said second mask is driven.

77. (New) The apparatus according to claim 76, further comprising an arithmetic device for calculating aberration of said projection optical system on the basis of a measurement result of said measurement device.

78. (New) The apparatus according to claim 76, further comprising an arithmetic device for calculating ray aberration of said projection optical system on the basis of a measurement result of said measurement device.

79. (New) The apparatus according to claim 76, further comprising an arithmetic device for calculating wavefront aberration of said projection optical system on the basis of a measurement result of said measurement device.

80. (New) The apparatus according to claim 76, wherein said reflecting mirror includes a spherical mirror.

81. (New) A method of measuring aberration of a projection optical system in a projection exposure apparatus for projecting a pattern on a substrate via the projection optical system,

the projection exposure apparatus having

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding an optical element which propagates light toward the projection optical system, and

a mask which is arranged near an image plane or object plane of the projection optical system or a plane conjugate to the image plane and object plane and has a transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which emerges from the optical element, and passes through the projection optical system and the transmission portion of the mask while the mask is driven along a plane of an image of the optical element formed by the projection optical system; and

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step.

82. (New) A method of measuring aberration of a projection optical system in a projection exposure apparatus for projecting a pattern on a substrate via the projection optical system,

the projection exposure apparatus having

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an illumination system,
a projection optical system for projecting a pattern on a substrate,
a holding portion for holding a first mask having a first transmission portion
between the illumination system and the projection optical system, and
a second mask which is arranged near an image-side focal position of the
projection optical system and has a second transmission portion,
the method comprising:
the measurement step of measuring a change in intensity of light which is emitted
by the illumination system and passes through the first transmission portion, the projection
optical system, and the second transmission portion while the second mask is driven along an
image plane of the projection optical system; and
the arithmetic step of calculating aberration of the projection optical system on the
basis of a measurement result obtained in the measurement step.

83. (New) A method of measuring aberration of a projection optical system in a
projection exposure apparatus for projecting a pattern on a substrate via the projection optical
system,
the projection exposure apparatus having
an illumination system,
a projection optical system for projecting a pattern on a substrate,
a first holding portion for holding a first mask having a first transmission portion
between the illumination system and the projection optical system;

a first reflecting mirror arranged on an image plane side of the projection optical system,

a second mask which is arranged between the illumination system and the projection optical system and has a second transmission portion, and

a second reflecting mirror for deflecting, toward the second transmission portion, light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the first reflecting mirror, and passes through the projection optical system again,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion of the first mask and the projection optical system, is reflected by the first reflecting mirror, passes through the projection optical system again, is reflected by the second reflecting mirror, and passes through the second transmission portion of the second mask while the second mask is driven in a predetermined plane; and

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step.

84. (New) A method of measuring aberration of a projection optical system in a projection exposure apparatus for projecting a pattern on a substrate via the projection optical system,

the projection exposure apparatus having

an illumination system,
a projection optical system for projecting a pattern on a substrate,
a holding portion for holding a first mask having a first transmission portion
between the illumination system and the projection optical system,
a second mask which is arranged near an object plane of the projection optical
system and has a second transmission portion, and
a reflecting mirror arranged on an image plane side of the projection optical
system, light which is emitted by the illumination system, passes through the first transmission
portion and the projection optical system, is reflected by the reflecting mirror, and passes through
the projection optical system again being incident on the second transmission portion

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the
illumination system, passes through the first transmission portion and the projection optical
system, is reflected by the reflecting mirror, passes through the projection optical system again,
and passes through the second transmission portion while the second mask is driven along the
object plane of the projection optical system; and

the arithmetic step of calculating aberration of the projection optical system on the
basis of a measurement result obtained in the measurement step.

85. (New) A method of measuring aberration of a projection optical system in a
projection exposure apparatus for projecting a pattern on a substrate via the projection optical
system,

the projection exposure apparatus having
a substrate stage,
a projection optical system for projecting a pattern on a substrate on the substrate stage,

a first mask which is arranged between the projection optical system and the substrate stage and has a first transmission portion,

an illumination system for illuminating the first transmission portion,

a second mask which is arranged between the projection optical system and the substrate stage and has a second transmission portion, and

a reflecting mirror arranged on an object side of the projection optical system, light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, and passes through the projection optical system again being incident on the second transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, passes through the projection optical system again, and passes through the second transmission portion while the second mask is driven along an image plane of the projection optical system; and

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step.

86. (New) A transfer method of transferring a pattern to a substrate by using a projection exposure apparatus,

the projection exposure apparatus having

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding an optical element which propagates light toward the projection optical system, and

a mask which is arranged near an image plane or object plane of the projection optical system or a plane conjugate to the image plane and object plane and has a transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which emerges from the optical element, and passes through the projection optical system and the transmission portion of the mask while the mask is driven along a plane of an image of the optical element formed by the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of aberration obtained in the arithmetic step; and

the transfer step of transferring a pattern to the substrate by using the projection exposure apparatus in which the projection optical system is adjusted.

87. (New) A transfer method of transferring a pattern to a substrate by using a projection exposure apparatus,

the projection exposure apparatus having

an illumination system,

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding a first mask having a first transmission portion

between the illumination system and the projection optical system, and

a second mask which is arranged near an image-side focal position of the

projection optical system and has a second transmission portion,

the method comprising:

the measurement step of measuring a change in intensity of light which is emitted by the illumination system and passes through the first transmission portion, the projection optical system, and the second transmission portion while the second mask is driven along an image plane of the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step; and

the transfer step of transferring a pattern to the substrate by using the projection exposure apparatus in which the projection optical system is adjusted.

88. (New) A transfer method of transferring a pattern to a substrate by using a projection exposure apparatus,

the projection exposure apparatus having

an illumination system,
a projection optical system for projecting a pattern on a substrate,
a first holding portion for holding a first mask having a first transmission portion
between the illumination system and the projection optical system;

a first reflecting mirror arranged on an image plane side of the projection optical
system,

a second mask which is arranged between the illumination system and the
projection optical system and has a second transmission portion, and

a second reflecting mirror for deflecting, toward the second transmission portion,
light which is emitted by the illumination system, passes through the first transmission portion
and the projection optical system, is reflected by the first reflecting mirror, and passes through
the projection optical system again,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the
illumination system, passes through a first transmission portion of the first mask and the
projection optical system, is reflected by the first reflecting mirror, passes through the projection
optical system again, is reflected by the second reflecting mirror, and passes through the second
transmission portion of the second mask while the second mask is driven in a predetermined
plane;

the arithmetic step of calculating aberration of the projection optical system on the
basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projecting optical system on the basis of aberration obtained in the arithmetic step; and

the transfer step of transferring a pattern to the substrate by using the projection exposure apparatus in which the projection optical system is adjusted.

89. (New) A transfer method of transferring a pattern to a substrate by using a projection exposure apparatus,

the projection exposure apparatus having

an illumination system,

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding a first mask having a first transmission portion between the illumination system and the projection optical system,

a second mask which is arranged near an object plane of the projection optical system and has a second transmission portion, and

a reflecting mirror arranged on an image plane side of the projection optical system, light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, and passes through the projection optical system again being incident on the second transmission portion

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, passes through the projection optical system again,

and passes through the second transmission portion while the second mask is driven along the object plane of the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of aberration obtained in the arithmetic step; and

the transfer step of transferring a pattern to the substrate by using the projection exposure apparatus in which the projection optical system is adjusted.

90. (New) A transfer method of transferring a pattern to a substrate by using a projection exposure apparatus,

the projection exposure apparatus having

a substrate stage,

a projection optical system for projecting a pattern on a substrate on the substrate stage,

a first mask which is arranged between the projection optical system and the substrate stage and has a first transmission portion,

an illumination system for illuminating the first transmission portion,

a second mask which is arranged between the projection optical system and the substrate stage and has a second transmission portion, and

a reflecting mirror arranged on an object side of the projection optical system, light which is emitted by the illumination system, passes through the first transmission portion

and the projection optical system, is reflected by the reflecting mirror, and passes through the projection optical system again being incident on the second transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, passes through the projection optical system again, and passes through the second transmission portion while the second mask is driven along an image plane of the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of aberration obtained in the arithmetic step; and

the transfer step of transferring a pattern to the substrate by using the projection exposure apparatus in which the projection optical system is adjusted.

91. (New) A method of manufacturing a device by using a projection exposure apparatus,

the projection exposure apparatus having

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding an optical element which propagates light toward the projection optical system, and

a mask which is arranged near an image plane or object plane of the projection optical system or a plane conjugate to the image plane and object plane and has a transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which emerges from the optical element, and passes through the projection optical system and the transmission portion of the mask while the mask is driven along a plane of an image of the optical element formed by the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of the aberration obtained in the arithmetic step;

the transfer step of transferring a pattern to a photosensitive member of the substrate coated with the photosensitive member by using the projection exposure apparatus in which the projection optical system is adjusted; and

the developing step of developing the photosensitive member bearing the pattern.

92. (New) A method of manufacturing a device by using a projection exposure apparatus,

the projection exposure apparatus having

an illumination system,

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding a first mask having a first transmission portion between the illumination system and the projection optical system, and

a second mask which is arranged near an image-side focal position of the projection optical system and has a second transmission portion,

the method comprising:

the measurement step of measuring a change in intensity of light which is emitted by the illumination system and passes through the first transmission portion, the projection optical system, and the second transmission portion while the second mask is driven along an image plane of the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of the aberration obtained in the arithmetic step;

the transfer step of transferring a pattern to a photosensitive member of the substrate coated with the photosensitive member by using the projection exposure apparatus in which the projection optical system is adjusted; and

the developing step of developing the photosensitive member bearing the pattern.

93. (New) A method of manufacturing a device by using a projection exposure apparatus,

the projection exposure apparatus having

an illumination system,

a projection optical system for projecting a pattern on a substrate,

a first holding portion for holding a first mask having a first transmission portion between the illumination system and the projection optical system,

a second mask which is arranged between the illumination system and the projection optical system and has a second transmission portion, and

a second reflecting mirror for deflecting, toward the second transmission portion, light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the first reflecting mirror, and passes through the projection optical system again,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion of the first mask and the projection optical system, is reflected by the first reflecting mirror, passes through the projection optical system again, is reflected by the second reflecting mirror, and passes through the second transmission portion of the second mask while the second mask is driven in a predetermined plane;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of the aberration obtained in the arithmetic step;

the transfer step of transferring a pattern to a photosensitive member of the substrate coated with the photosensitive member by using the projection exposure apparatus in which the projection optical system is adjusted; and

the developing step of developing the photosensitive member bearing the pattern.

94. (New) A method of manufacturing a device by using a projection exposure apparatus,

the projection exposure apparatus having

an illumination system,

a projection optical system for projecting a pattern on a substrate,

a holding portion for holding a first mask having a first transmission portion

between the illumination system and the projection optical system,

a second mask which is arranged near an object plane of the projection optical system and has a second transmission portion, and

a reflecting mirror arranged on an image plane side of the projection optical system, light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, and passes through the projection optical system again being incident on the second transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, passes through the projection optical system again, and passes through the second transmission portion while the second mask is driven along the object plane of the projection optical system;

the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of the aberration obtained in the arithmetic step;

the transfer step of transferring a pattern to a photosensitive member of the substrate coated with the photosensitive member by using the projection exposure apparatus in which the projection optical system is adjusted; and

the developing step of developing the photosensitive member bearing the pattern.

95. (New) A method of manufacturing a device by using a projection exposure apparatus,

the projection exposure apparatus having

a substrate stage,

a projection optical system for projecting a pattern on a substrate on the substrate stage,

a first mask which is arranged between the projection optical system and the substrate stage and has a first transmission portion,

an illumination system for illuminating the first transmission portion,

a second mask which is arranged between the projection optical system and the substrate stage and has a second transmission portion, and

a reflecting mirror arranged on an object side of the projection optical system, light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, and passes through the projection optical system again being incident on the second transmission portion,

the method comprising:

the measurement step of measuring an intensity of light which is emitted by the illumination system, passes through the first transmission portion and the projection optical system, is reflected by the reflecting mirror, passes through the projection optical system again, and passes through the second transmission portion while the second mask is driven along an image plane of the projection optical system;

Q' the arithmetic step of calculating aberration of the projection optical system on the basis of a measurement result obtained in the measurement step;

the adjustment step of adjusting the projection optical system on the basis of the aberration obtained in the arithmetic step;

the transfer step of transferring a pattern to a photosensitive member of the substrate coated with the photosensitive member by using the projection exposure apparatus in which the projection optical system is adjusted; and

the developing step of developing the photosensitive member bearing the pattern.
